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LOCKHEED HYDRAULIC BRAKE COMPANY LTD.

HYDRAULIC BRAKES

(PRIOR TO TWO LEADING SHOE)

FOR

CARS AND LIGHT COMMERCIAL VEHICLES

SERVICE MANUAL

One of the Automotive Products Group

AUTOMOTIVE PRODUCTS COMPANY LTD.

SERVICE & SPARE PARTS DIVISION

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SERVICE MANUAL

GENUINE Lockheed
REGD TRADE MARK

HYDRAULIC BRAKES

(PRIOR TO TWO LEADING SHOE)

FOR

CARS AND LIGHT COMMERCIAL VEHICLES

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One of the Automotive Products Group

SECTION I

DESCRIPTION AND OPERATION

SECTION 1 DESCRIPTION AND OPERATION

DESCRIPTION

The braking system comprises four leading and trailing shoe brake asemblies which are operated by fluid pressure generated in a master cylinder. Each front brake assembly has two brake shoes mounted upon an anchor pin in the brake backplate, and a double-piston wheel cylinder is located between the free ends of the shoes. The rear brakes are similar to those at the front except that, with car brakes, a lever mechanism is provided for handbrake operation ; in the instance of light commercial vehicle brakes the place of the wheel cylinder is taken by a bisector assembly which is operated by a transverse wheel cylinder at the rear of the backplate. The master cylinder is connected to the brake assemblies by means of metal tubing and flexible hoses.

OPERATION

From the very simplified diagram of a typical braking system (Fig. 1) it will be seen that the master cylinder, pipeline and wheel cylinders form one vessel which is filled with Lockheed Hydraulic Brake Fluid.

The master cylinder has a single piston, whilst each wheel cylinder has two, all pistons being provided with rubber seals to maintain pressure and prevent loss of fluid.

When the brake pedal is depressed, the master cylinder piston applies a force to the fluid which, being incompressible, is displaced through the pipes and thrusts the wheel cylinder pistons apart until the brake shoes contact the drums. One shoe of each brake assembly will be applied in the same sense of rotation as the drum and is termed the " leading shoe," the other is applied in the opposite sense of rotation and is termed " trailing."

When the pressure on the brake pedal is released, the brake shoe pull-off springs cause the brake shoes to move away from the drums, and the wheel cylinder pistons are thrust back to the " off " position ; whilst this is occurring, fluid is displaced back to the master cylinder ready for the next brake application.

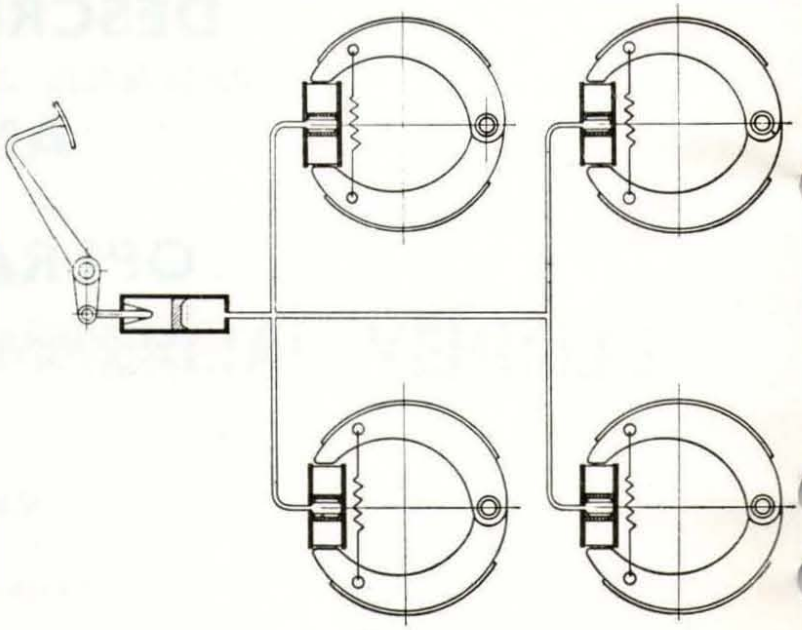


Fig. 1

SECTION 2

ROUTINE ATTENTION

SECTION 2 ROUTINE ATTENTION

(1) The fluid level in the master cylinder or, if applicable, in the separate supply tank, should be checked every 1,000 miles or once a month (whichever occurs first) and replenished if necessary. Prior to unscrewing the filler cap, clean the area around it to prevent dirt entering when it is removed. The correct fluid level is to within $\frac{1}{4}$ in. below the bottom of the filler cap orifice. Great care should be taken not to spill any brake fluid on the bodywork of the vehicle since this fluid is injurious to paint. Refit the filler cap, together with its gasket, and securely tighten. USE ONLY GENUINE LOCKHEED SUPER 105 BRAKE FLUID TO SPEC. S.A.E. J1703 WHEN TOPPING UP.

The addition of fluid should be required only at extremely long intervals, and a considerable fall in the fluid level would indicate an external leak at some point in the system which should be traced and rectified immediately. To check for leaks, apply firm pressure to the brake pedal whilst an assistant examines the units, pipes, hoses and fittings.

(2) Ensure that the air vent in the filler cap is not choked, since blockage would cause the brakes to drag.

(3) Adjust the brakes before the pedal travels to within one inch of the floor without solid resistance being felt.

(4) Every 5,000 miles examine brake linings and renew if worn to less than a third of their original thickness. Check brake drums for excessive wear and ensure that linings are not contaminated by lubricating oil or grease. Whilst doing this, also check for wheel cylinder and master cylinder leakage.

(5) Brake hoses must be examined every 10,000 miles for any signs of leakage, chafing or general deterioraation. If there is any doubt, renew the hose. It is recommended in any case that hoses are renewed at least every three years or 40,000 miles. When checking hoses, also inspect metal pipes for chafing or looseness.

(6) At intervals not exceeding three years or 40,000 miles, or at each third change of a brake lining, whichever occurs first, renew all rubber cups and seals throughout the system.

USE OF THE GENUINE LOCKHEED FLUID

The special fluid used in Lockheed brakes is one of the most important factors in the correct operation of the hydraulic system, for no equipment will give satisfaction with incorrect fluid. When topping up or overhauling the system use only the genuine Lockheed Super 105 Brake Fluid to Spec. S.A.E. J1703 for it lengthens the life of all internal parts, acts as an efficient lubricant and operates satisfactorily under all extremes of temperature throughout the world. **The use of any other fluid nullifies all guarantees.**

SECTION 3

ADJUSTMENTS

SECTION 3 ADJUSTMENTS

BRAKE PEDAL ADJUSTMENT

In order to ensure the complete return of the piston in the brake master cylinder, it is necessary to provide a minimum clearance between the piston and the push rod which operates it, so ensuring that the piston is fully back against its stop when the pedal is released. This is important, since if the piston is prevented from returning fully the lip of the main cup will cover the by-pass port and prevent the escape to tank of the excess fluid drawn into the cylinder during the return stroke of the piston ; the brakes would, therefore, drag or remain " on."

The correct pedal adjustment is set when the vehicle is assembled and should never need alteration. A minimum clearance of $\frac{1}{32}$" is necessary between the push-rod and the piston, which gives a safety margin of $\frac{3}{8}$"–$\frac{1}{2}$" free pedal movement at the pedal pad (refer to Fig. 2). This free movement can be felt if the pedal is depressed gently by hand. Should it not be apparent, first check to make sure that the pedal is not being fouled by a displaced mat preventing the complete return of the pedal to the " off " position. In the event of the adjustment having been disturbed, slacken the locknut " A " (Refer to Fig 2.) and reset the length of the push-rod extension until the pedal can be depressed the correct amount before the piston begins to move. Re-tighten the locknut.

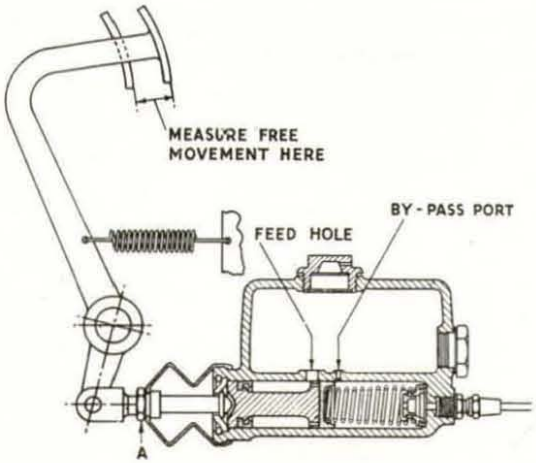


Fig. 2

BRAKE SHOE ADJUSTMENT

With hydraulic brakes adjustment is carried out quickly and easily without the aid of special tools and as they are balanced automatically there is no need to jack up all four wheels at the same time. There are several methods of setting the clearance between the shoes and drums but only those most commonly used are described here—if these do not apply reference should be made to the vehicle instruction manual. In all cases make sure the handbrake is off.

TWO-POINT CAM ADJUSTMENT

Jack up until wheel revolves freely. Turn one adjuster as indicated by arrow " C " in Fig. 3 (only a partial turn is required) until the wheel is locked. Now back off the adjuster the slightest possible amount to allow the wheel to revolve freely. Repeat this operation with the other adjuster after which this particular brake is correctly adjusted.

Repeat the above for all brakes.

SINGLE-POINT CAM ADJUSTMENT

It is not necessary to jack up the wheels where this type of adjuster is fitted. As the adjuster has to slide in the backplate to centralize itself, it is advisable to clean off all mud around it and apply a little penetrating oil which should be allowed to soak in.

Turn the handwheel as indicated by arrow " C " in Fig. 4 until the shoes are in contact with the drum. DO NOT USE ANY FORM OF TOOL ON THE HAND-WHEEL. On releasing the handwheel the adjuster will spring back and automatically set the correct shoe clearance.

Repeat the above for all brakes.

It may be found that a slightly finer adjustment can be made if an assistant holds the footbrake on whilst the adjustment is carried out, as this will overcome the resistance offered by the shoe pull-off spring against the turning of the adjuster.

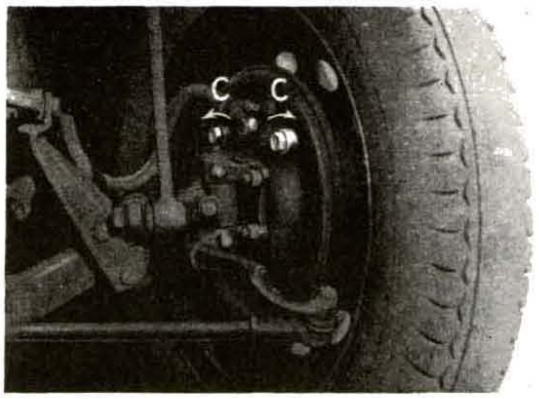


Fig. 3

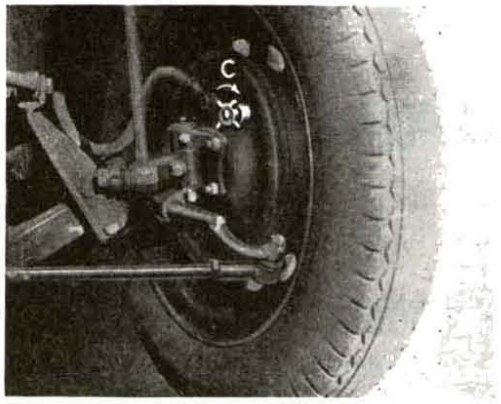


Fig. 4

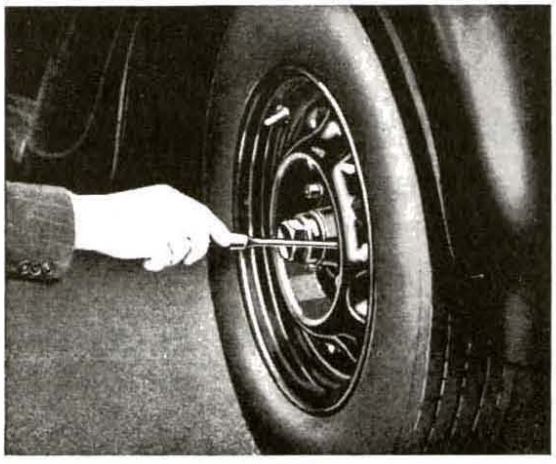


Fig. 5

SINGLE-POINT NOTCHED DISC ADJUSTMENT

This method is employed where a transverse wheel cylinder is fitted on the outside of the brake backplate. Access to the notched disc is obtained by removing the wheel dust cap, revealing a hole through the wheel and brake drum (Fig. 5). Proceed as follows :— Jack up until wheel revolves freely, then turn wheel until the hole through drum is opposite notched disc. Insert screw driver or similar tool and turn disc until wheel is locked. Now turn disc in opposite direction (usually about six notches) until wheel is free to revolve again.

Repeat the above for all brakes of this type.

IMPORTANT.—It is necessary for the transverse cylinder to slide on the backplate in order to centralise itself when adjusting brake shoes.

Clean off all mud around it and apply a little penetrating oil. Also check the fixing nuts to see that they are not holding the cylinder tightly against the backplate. The correct amount of freedom will be obtained by tightening the nuts until the double spring washers are fully compressed and then slackening them half a turn.

2-POINT NOTCHED DISC ADJUSTMENT

This method of adjustment consists of turning notched discs attached to the end caps of an internal wheel cylinder, thus causing the adjuster screws to tighten or slacken the adjustment according to the direction of rotation.

Access to the notched discs is obtained by removing the wheel dust cap which reveals a hole through the wheel and brake drum (Fig. 5). Proceed as follows :— Jack up until wheel revolves freely, then turn wheel until hole through drum is opposite a notched disc. Insert a screw driver or similar tool and turn disc until wheel is locked. Now turn disc in opposite direction (usually about 4 notches) until wheel is free to revolve again. Turn wheel until hole is opposite other notched disc and repeat the operation.

Repeat above for all brakes.

SECTION 4

OVERHAUL INSTRUCTIONS

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SECTION 4 OVERHAUL INSTRUCTIONS

ROUTINE INSTRUCTIONS

Should it be found necessary to dismantle the braking system, *i.e.* master cylinder or wheel cylinders, the operation must be carried out under conditions of scrupulous cleanliness. Clean off the mud and grease before removing the unit. Dismantle on a bench covered with a sheet of clean paper. Do not handle the internal parts—particularly rubbers—with dirty hands. Do not swill a unit, after removal from the vehicle, in paraffin, petrol or trichlorethylene as this will ruin rubber parts and, on dismantling, will give a misleading impression of their original condition. Place all metal parts in a tray of clean brake fluid to soak, afterwards dry off with a clean, fluffless cloth and lay out in order on a clean sheet of paper. Rubber parts should be carefully examined and, if there is any doubt of their condition, a comparison should be made with new parts. Any signs of swollen cups or perished rubber indicate that they should be renewed immediately. To ensure unfailing reliability, it is usually advisable to replace all rubber parts with new ones these being readily available in the form of Repair Kits, containing all the rubber components required for each particular unit. The main castings may be swilled in industrial methylated spirit or Lockheed Super 105 Brake Fluid to Spec. S.A.E. J1703, but if spirit is used all traces of the cleaner **must be dried out before assembly.** In the case of the master cylinder, make sure that the by-pass port is clear by probing with a piece of fine wire. The brakes will drag if the by-pass port is clogged as pressure will build up in the system, thereby forcing the shoes into contact with the drums. The port is deliberately drilled first with a $\frac{1}{8}$" drill halfway and then completed with a ·028" drill which just breaks through into the bore. A peening operation at the point of entry into the bore obviates the risk of the main cup tearing on a ragged edge.

All internal parts should be dipped in Lockheed Super 105 Brake Fluid to Spec. S.A.E. J1703, and assembled wet; when assembling rubber parts use the fingers only.

Stores departments should exercise special care in handling brake parts to ensure that no damage is caused which would affect their correct functioning when assembled. Rubbers should be stored in a cold, dark place well removed from any fumes.

MASTER CYLINDER

The type of master cylinder used varies according to the vehicle on which it is fitted ; there are three main types, two of which (shown on Figs. 8 & 9) incorporate tanks to hold the reserve of brake fluid whilst the third (shown on Fig. 6) is fed from a separate tank. All three types have similar internal parts and function in an identical manner. Some vehicles are fitted with a tandem

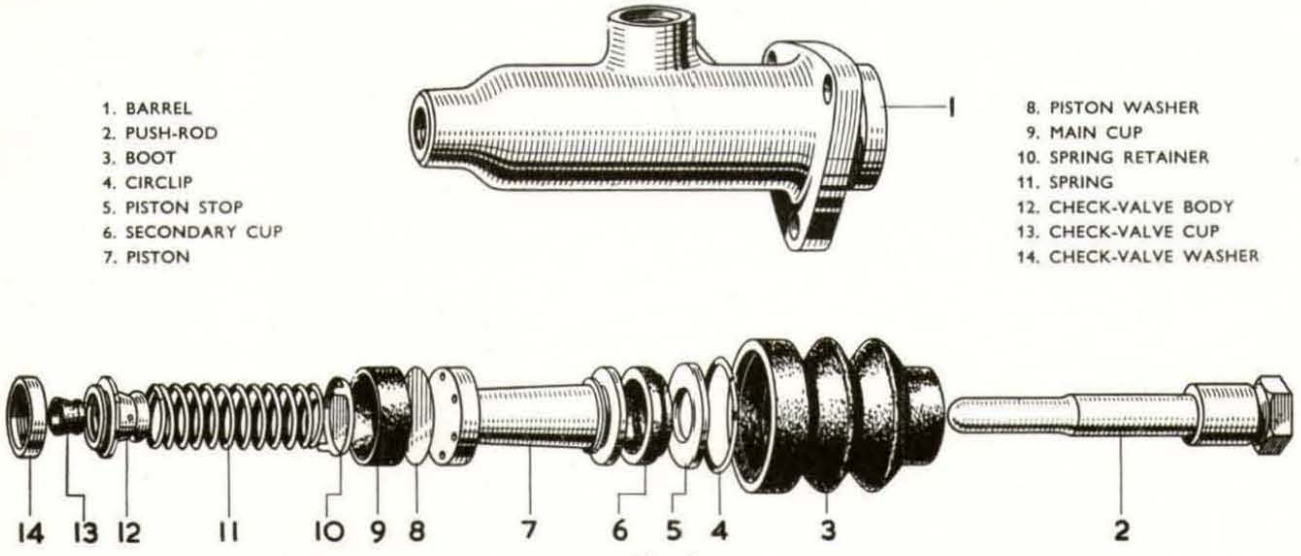


Fig. 6

master cylinder (a typical example of which is shown on Fig. 10) ; this type of cylinder is supplied in two forms, with an integral reserve tank or fed from a separate tank (as illustrated).

Description (Refer to Fig. 6).

A piston (7) is contained within the barrel (1), and has a rubber main cup (9) spring-loaded against its inner end ; between the cup and the piston a thin washer (8) is fitted to prevent the cup from being drawn into the small feed holes drilled around the piston-head. The outer end of the piston carries a rubber secondary cup (6) and is formed with a depression to receive the spherical end of a push-rod (2). A rubber boot (3) which fits on the end of the barrel and on the push-rod, prevents the intrusion of dirt and moisture into the cylinder.

At the end opposite to the push-rod, a check-valve assembly is fitted, comprising a metal body (12) into which a rubber cup (13) is fitted, this assembly is loaded against a rubber valve washer (14) by the piston return spring (11).

Principle of operation.

Depressing the brake pedal causes the push-rod to thrust the piston along the bore of the barrel, and the fluid thus displaced lifts the lip of the cup away from the holes in the check-valve body and passes to the brake wheel cylinders.

Upon removal of the load from the brake pedal, the return spring thusts the piston back against its stop faster than fluid is able to return from the wheel cylinders ; this creates a depression in the master cylinder which draws the edge of the main cup away from the head of the piston and allows fluid from the tank to flow through the feed holes thus uncovered to make up the temporary deficiency.

Meanwhile fluid returning from the wheel cylinders, being under load from the brake shoe pull-off springs, lifts the check-valve away from its seat and re-enters the master cylinder.

When the piston is fully back against its stop, the main cup uncovers a small by-pass port in the barrel, and this allows the release of excess fluid to the tank, thus permitting the pull-off springs to return the brake shoes to the fully " off " position ; the by-pass port also compensates for contraction or expansion of the fluid, due to changes in temperature, allowing fluid to flow into or escape from the system. Should this port become blocked any excess fluid would be unable to escape and the brakes would consequently drag.

The purpose of the check-valve is to prevent the re-entry into the master cylinder of fluid pumped into the line during the " bleeding " operation ; this ensures a fresh charge of fluid at each stroke of the brake pedal and a complete purge of air from the system.

Removing the master cylinder from the vehicle.

(1) In the instance of cylinders which are fed from a separate supply tank, empty fluid from the tank by attaching a rubber tube to a bleeder screw in one of the wheel cylinders, slacken the screw one complete turn and pump the brake pedal until the tank is empty.

(2) Brush away any dirt from the pipe connections, disconnect the pipe from the end of the cylinder, and plug the end of the pipe to prevent the entry of dirt and/or the loss of fluid.

(3) With the types of cylinder shown on Figs. 8 & 9 detach the push-rod from the brake-pedal linkage ; with the other type the rubber boot may be detached from the end of the cylinder, and the push-rod left attached to the linkage.

(4) Unscrew the fixing bolts, detach the master cylinder from the vehicle, and drain the remaining fluid from it.

Dismantling (Refer to Fig. 6)

(1) Depress the piston to relieve the spring-load from the circlip (4), remove the circlip and the piston-stop (5), and withdraw the piston (7), the piston washer, the main cup (9), the spring, the check-valve and the rubber valve washer (14).

(2) Remove the secondary cup (6) by stretching it over the end of the piston, and remove the cup (13) from the check-valve body (12).

Assembling (Refer to Fig. 6)

(1) Using the fingers only, stretch the secondary cup (6) on to the piston (7), with the lip facing the piston-head (i.e., the drilled end) ; gently work round the cup, with the fingers, to ensure correct bedding. Ease the cup (13) into the check-valve body (12) and bed it into position with the fingers only.

(2) Insert the rubber valve washer (14) into the bore of the barrel (1), and push down until it seats squarely against the end face of the bore.

(3) Locate the spring retainer (10) on the appropriate end of the spring (11), and bend over the tabs to secure it. Locate the check-valve assembly at the other end of the spring.

(4) Hold the barrel so that the outlet is uppermost, and insert the spring, with the check-valve leading. Reverse the barrel and insert the main cup (9), lip leading, taking care not to turn back or buckle the lip.

(5) Insert the piston washer (8) so that the curved edge is towards the cup (as shown on Fig. 7).

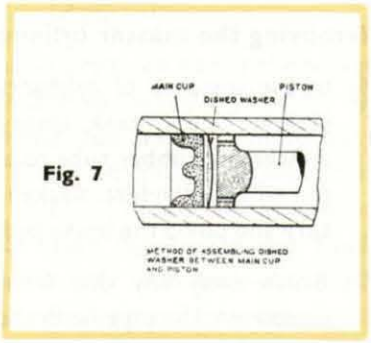


Fig. 7

(6) Insert the piston (7) into the barrel, with the drilled head innermost.

(7) Push the piston down the bore, locate the piston stop (5) within the bore and fit the circlip (4) into its groove ; it is MOST IMPORTANT that the circlip be correctly fitted in its groove.

Re-fitting the master cylinder to the Vehicle

(1) Secure the master cylinder to the vehicle by fitting the fixing bolts and, with the types of cylinder shown on Figs. 8 & 9, attach the push-rod to the brake pedal linkage.

(2) If, with the type of cylinder shown on Fig. 6, the push-rod was previously removed from the brake pedal linkage, it should now be re-fitted. After ensuring that the rubber boot is in position on the push-rod, insert the end of the rod into the cylinder.

(3) Stretch the large end of the boot onto the end of the cylinder.

(4) Check the brake pedal adjustment as detailed on page 6.

(5) If the cylinder is of the type which is fed from a separate or a supplementary tank, connect up the pipe from the tank to the top of the cylinder, ensuring that the end of the pipe is first unplugged.

(6) Fill the supply tank as indicated in Section 2, re-fit the filler cap (together with its gasket) and securely tighten.

(7) Test the master cylinder by pumping the brake pedal several times and allowing it to return unassisted ; after one or two applications fluid should flow from the outlet connection.

(8) Unplug the outlet pipe, and connect it to the end of the cylinder.

(9) " Bleed " the system as described in Section 5.

(10) Check for leaks by applying a firm pressure to the brake pedal and, whilst maintaining the pressure, inspect the " line " and connections.

1. FILLER PLUG
2. GASKET
3. COMBINED BARREL & TANK
4. BOOT
5. CIRCLIPS
6. PUSH-ROD & PISTON STOP ASSEMBLY
7. SECONDARY CUP
8. PISTON
9. PISTON WASHER
10. MAIN CUP
11. SPRING RETAINER
12. SPRING
13. CHECK-VALVE BODY
14. CHECK-VALVE CUP
15. CHECK-VALVE WASHER
16. DRAIN PLUG
17. GASKET

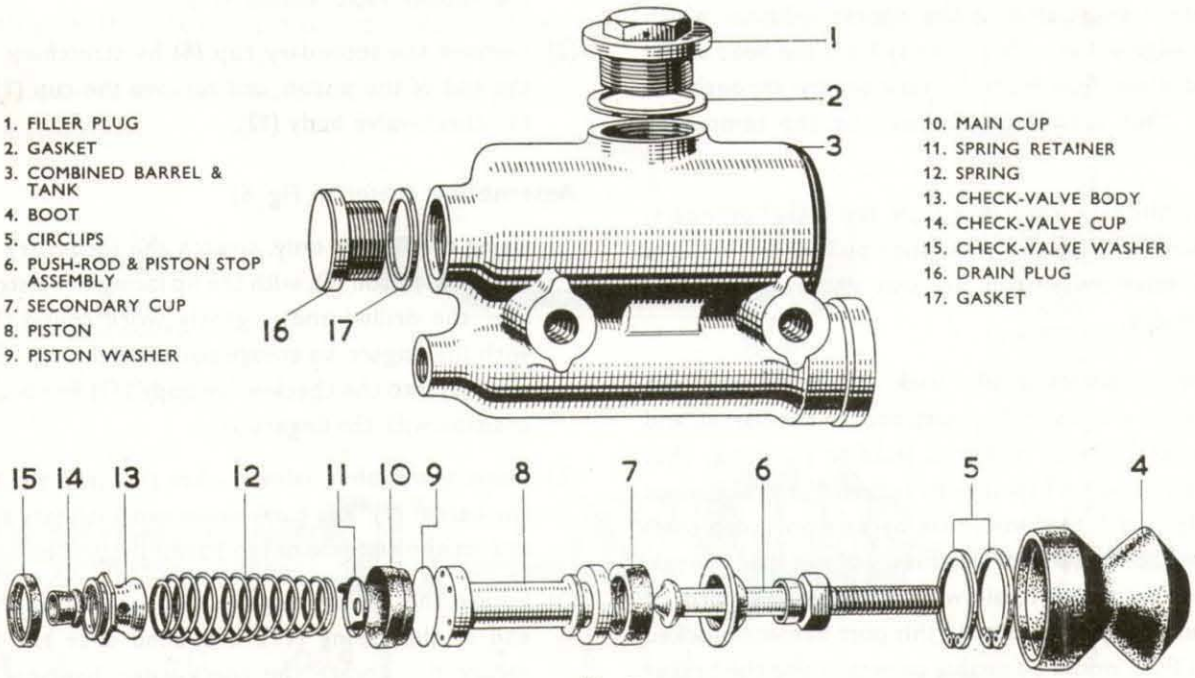


Fig. 8

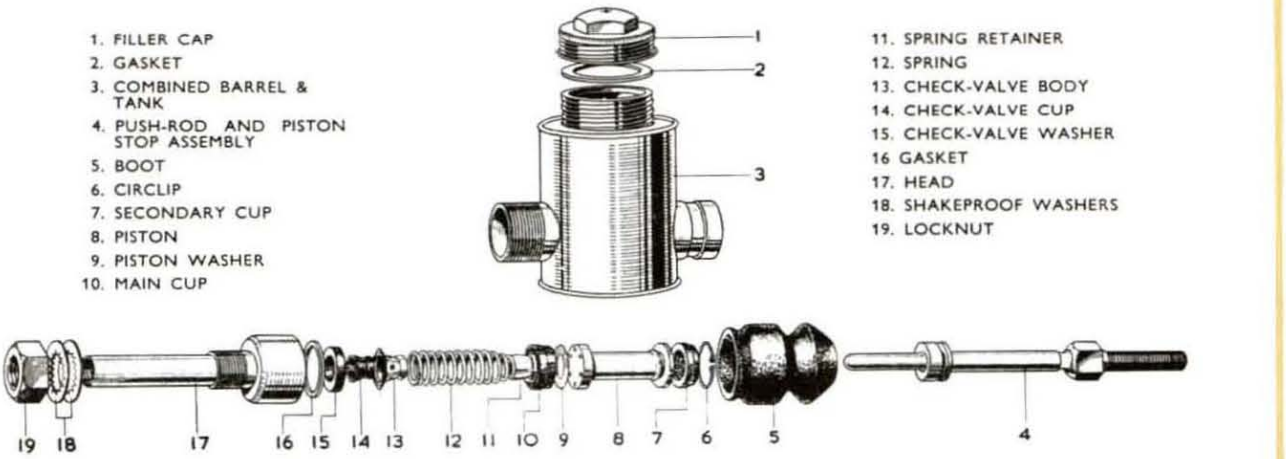


Fig. 9

TANDEM MASTER CYLINDER (Fig. 10)

This type of master cylinder actually consists of two separate and complete hydraulic systems so that in the unlikely event of one system failing as the result of excessive leakage there will still remain an effective brake. The type illustrated on Fig. 10 has a separate supply tank usually situated under the bonnet with two independent compartments feeding the two inlet ports on the cylinder. In the Integral tandem type, the tank and cylinder are cast as one.

The tandem master cylinder, in effect, consists of two barrel type master cylinders in line without any direct fluid communication between them. Each cylinder is fed from an independent compartment in the supply tank and each operates the brakes on one axle only. On depressing the brake pedal the primary piston (13) displaces fluid via the check valve (5) and the pipe line to the wheel cylinders on the front axle until the shoes touch the drums.

Further movement of the primary piston generates pressure in the primary cylinder which causes the secondary piston (22) to move forward and displace fluid via the check valve (29) and the pipe line to the wheel cylinders on the rear axle. When all shoe clearances have been taken up further effort on the pedal generates equal pressure in both cylinders by virtue of the secondary piston being a floating member. Thus all brakes are fully compensated despite the fact that two separate systems are in use. In the event of a leak occurring in the primary cylinder the primary piston would move forward without effect until it picked up the secondary piston. Further effort would apply the brakes which are operated by the secondary cylinder.

Should a leak occur in the secondary cylinder the pressure generated in the primary would first drive the secondary piston to the end of its stroke and then apply the front brakes. It is essential that the full stroke of a tandem cylinder is utilised in order that the safety feature is retained. To check this, open wheel cylinder bleeder screw at both front and rear brakes and depress the brake pedal. If all is in order the cylinder will prevent movement before the pedal reaches the floorboard. Should the pedal reach the floorboard either the pedal pad stem is too short, the mat too thick or the floorboard is out of position and the necessary correction should be made.

It is important to realise that the screw (20) is a stop for the secondary piston and not a drain plug—it should never be removed unless the cylinder is to be completely dismantled. When dismantling the cylinder, remove the circlip (11), piston (13), main cup (14) and spring (16) ; then unscrew the cylinder head (33) and remove the spring (25), thus relieving the secondary piston of any load which would tend to damage it when removing the stop pin (20). The secondary piston can be withdrawn through either end of the cylinder. When re-assembling push the secondary piston complete with cups into position so that the space formed by the reduced skirt of the piston comes opposite the stop pin hole to ensure that the piston is not trapped when inserting the stop pin.

1. VALVE ADAPTER
2. GASKET
3. CHECK-VALVE WASHER
4. CHECK-VALVE CUP
5. CHECK-VALVE BODY
6. CHECK-VALVE SPRING
7. CIRCLIP
8. BARREL
9. PUSH-ROD
10. BOOT
11. CIRCLIP
12. SECONDARY CUP
13. PRIMARY PISTON
14. MAIN CUP
15. SPRING RETAINER
16. PRIMARY SPRING
17. SPRING RETAINER
18. MAIN CUP
19. SECONDARY CUP
20. STOP PIN
21. WASHER
22. SECONDARY PISTON
23. MAIN CUP
24. SPRING RETAINER
25. SECONDARY SPRING
26. CIRCLIP
27. PISTON STOP
28. CHECK-VALVE SPRING
29. CHECK-VALVE BODY
30. CHECK-VALVE CUP
31. CHECK-VALVE WASHER
32. GASKET
33. CYLINDER HEAD

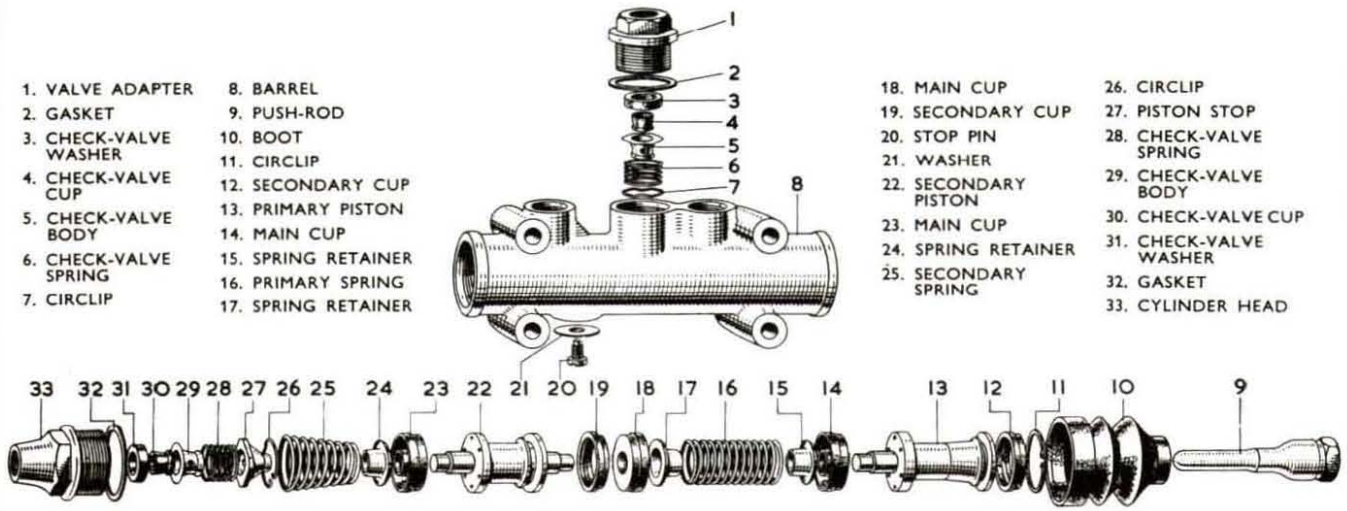


Fig. 10

BRAKE ASSEMBLIES

RE-FITTING SLOTTED OR HOODED SHOES (Fig. 11).

When reassembling Slotted or Hooded Shoes, after removal for any reason, it is essential to realise that the shoe with the rectangular hole, which carries the abutment washer, is the **leading** shoe and that with the plain hole is the **trailing** shoe.

First, thoroughly clean all moving parts and lubricate with LOCKHEED Expander Lubricant with special attention to steady pin slots and anchor pin holes in the brake shoe webs, the abutment washer and the anchor in itself. Fit one of the large plain washers to the anchor pin and offer up the inner shoe. (On near-side brakes, this is usually the slotted or hooded shoe and on off-side brakes, the plain one). Follow this with the outer shoe, a second large plain washer, the Thackray spring washer, the smaller plain washer and lastly the circlip, locating this in the groove in the end of the anchor pin. (**Note.**— Some assemblies have the spring washer fitted between the shoulder of the anchor pin and the first large plain washer). Fit the pull-off springs and complete the steady pin assemblies.

Now push the slotted or hooded shoe upwards to the fullest extent on its abutment washer. The brake drum can now be assembled.

Now spin the drum in a forward direction and apply the brake. This will centralise the slotted or hooded shoe within the drum.

Complete by adjusting the brakes until satisfactory results are obtained.

IMPORTANT : At no time must oil or grease be allowed in contact with the brake shoe linings. If contamination of this nature occurs, it is recommended that re-lined shoes be fitted.



Fig. 11

RELINING THE BRAKES

When re-lined brake shoes are being used, the same make and quality of lining specified by the vehicle manufacturer (or an approved alternative) must be used throughout, otherwise uneven braking will result despite equal pressure being exerted on all shoes. To enable this to be accomplished in the easiest possible manner, advantage should be taken of our *exchange shoe scheme*, particulars of which are obtainable from Lockheed stockists.

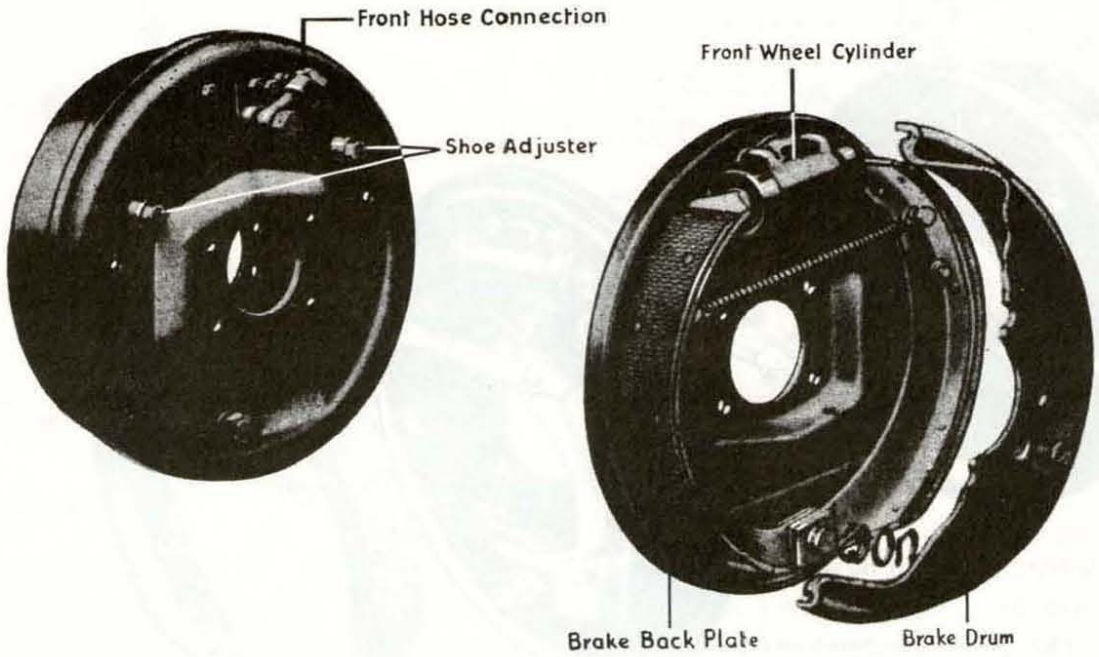


Fig. 12. Typical car brake

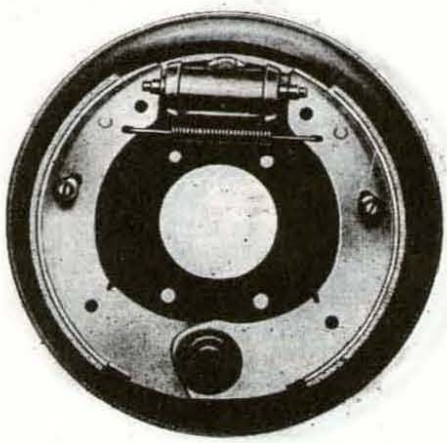


Fig. 13. Typical commercial brake

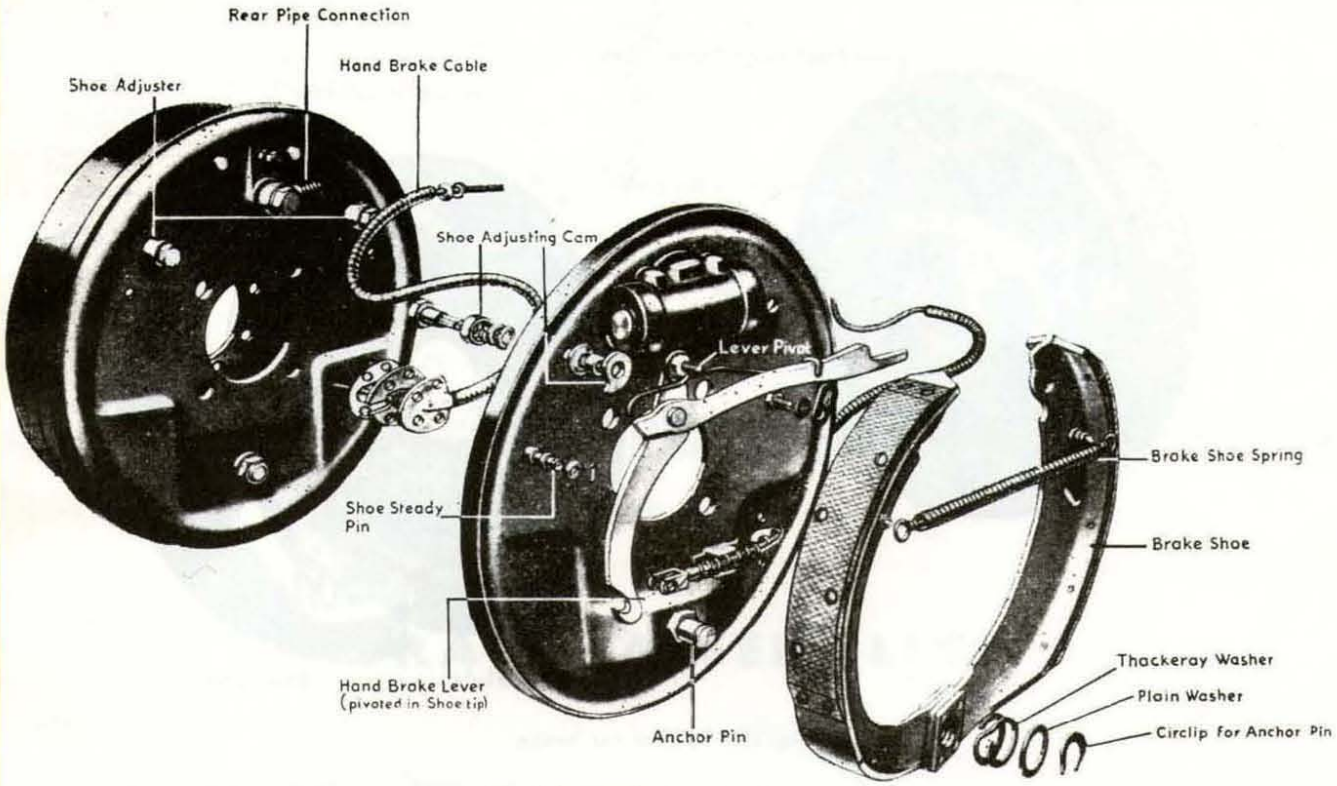


Fig. 14. Typical car brake

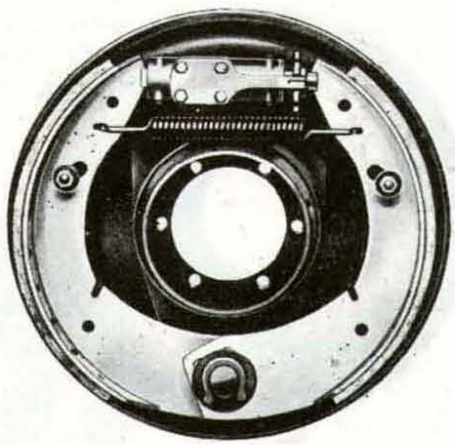


Fig. 15. Typical commercial brake

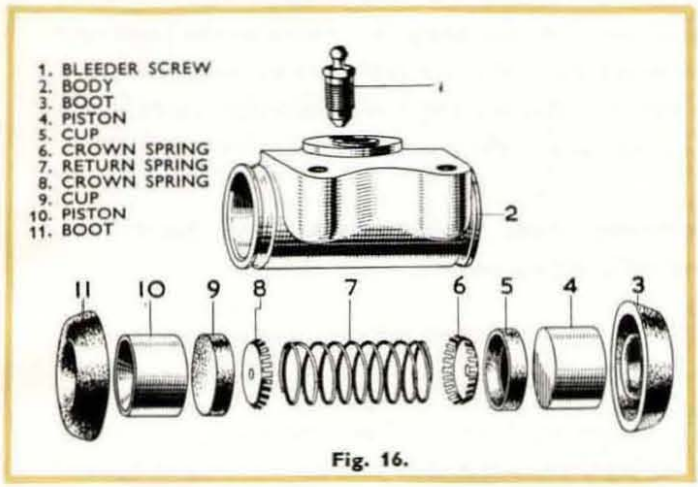


Fig. 16.

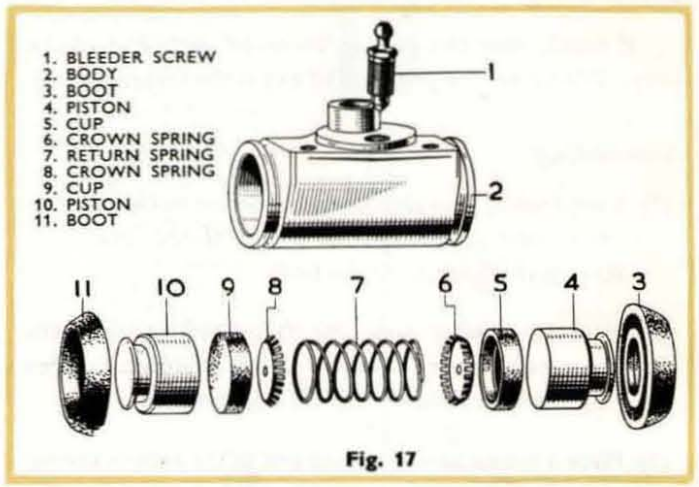


Fig. 17

THE WHEEL CYLINDERS

Typical internally-mounted wheel cylinders are shown on Figs. 16-18 ; the first of these is used with the type of brake assembly shown in Fig. 13, and its pistons impart thrust to the brake shoes via push rods. The wheel cylinder shown in Fig. 17 is used with the type of brake assembly shown in Figs. 12 & 14, and in this instance the pistons thrust direct against the brake shoes. Both of these wheel cylinders are non-adjustable, the brake shoes being adjusted by cams mounted in the backplate.

The third type (shown on Fig. 18) incorporates adjusters for the brake shoes, comprising end caps into which adjuster screws are threaded ; by turning these end caps, the adjuster screws are caused to move inwards or outwards so taking the brake shoes with them.

Rubber cups are loaded against the inner faces of the pistons by means of a return spring at each end of which a crown spring is located. The cylinders shown on Figs. 16 & 17 are fitted with rubber boots to prevent the intrusion of dirt and moisture.

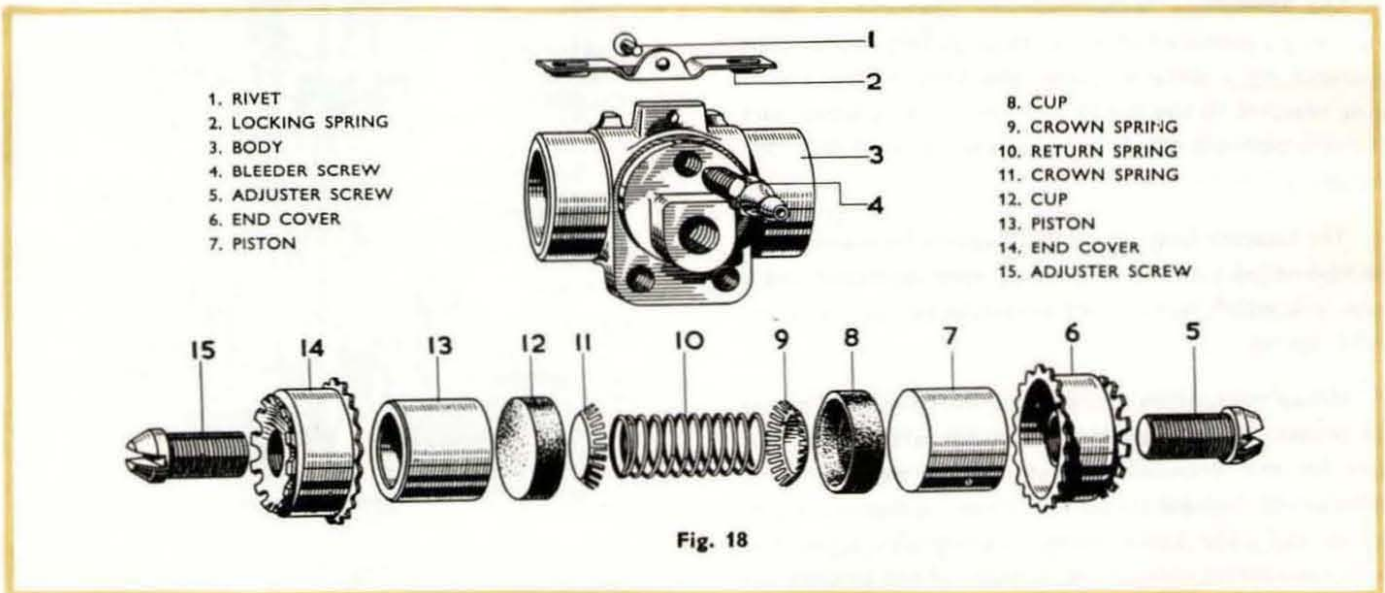


Fig. 18

Dismantling

If fitted, ease the rubber boots off each end of the body. Withdraw the pistons and expel the internal parts.

Assembling

(1) If applicable, ease the rubber boots on to the pistons. Insert one piston into one end of the body and stretch the boot on to the body.

(2) Insert a rubber cup, flat face leading, into the opposite end of the bore and push in with a wooden rod until it contacts the fitted piston.

(3) Place a crown spring at each end of the return spring, and insert these parts into the bore, followed by the second cup (lip innermost) taking great care not to turn back or buckle the lip.

(4) Insert the second piston into the bore and stretch the boot on to the body.

(5) If applicable, fit the end covers together with the adjuster screws.

TRANSVERSE WHEEL CYLINDER AND BISECTOR (Figs. 19-21).

These two units are used with the type of brake assembly shown on Fig. 15 ; they operate together, the transverse cylinder being mounted externally at the rear of the backplate whilst the bisector is mounted internally between the tips of the brake shoes. In addition to operating by hydraulic pressure, the transverse cylinder also incorporates hand-brake operating linkage.

The transverse wheel cylinder comprises a body containing a piston which passes through two rubber cups separated by a distance piece, the head of the piston being adjacent to the handbrake barrel ; this latter part carries a pull-rod which is connected to the handbrake linkage.

The bisector body houses two tappets between which are assembled a fork-end carrying two segments and a draw link which screws into a floating nut in the hand-brake barrel.

When the footbrake is applied, fluid pressure causes the piston to thrust against the handbrake barrel, this pulls on the drawlink causing the segments to roll between the bisector tappets which are pushed outwards and so apply the brake shoes. During this action the handbrake barrel slides along its pull-rod and so does not affect the positioning of the handbrake linkage. When the handbrake is applied, the pull-rod pulls on the handbrake barrel and the brakes are applied in an identical manner to that described for a hydraulic application, except that the positioning of the piston is undisturbed.

Removing from vehicle, dismantling, assembling and refitting to vehicle.

(1) Jack up vehicle and remove road wheel and brake drum.

(2) Disconnect fluid pipe from transverse cylinder and plug the end of pipe to prevent the entry of dirt and loss of fluid. Unscrew pull-rod from handbrake linkage.

(3) Unscrew stop pin, remove large boot clip, ease boot off body and remove circlip. Unscrew handbrake barrel assembly from draw link and remove from body. Remove self-locking nuts, take cylinder off mounting studs and extract piston, cups and distance piece.

(4) Withdraw the bisector, complete with packing piece. Remove end cover (ref. 12, Fig. 21), withdraw the

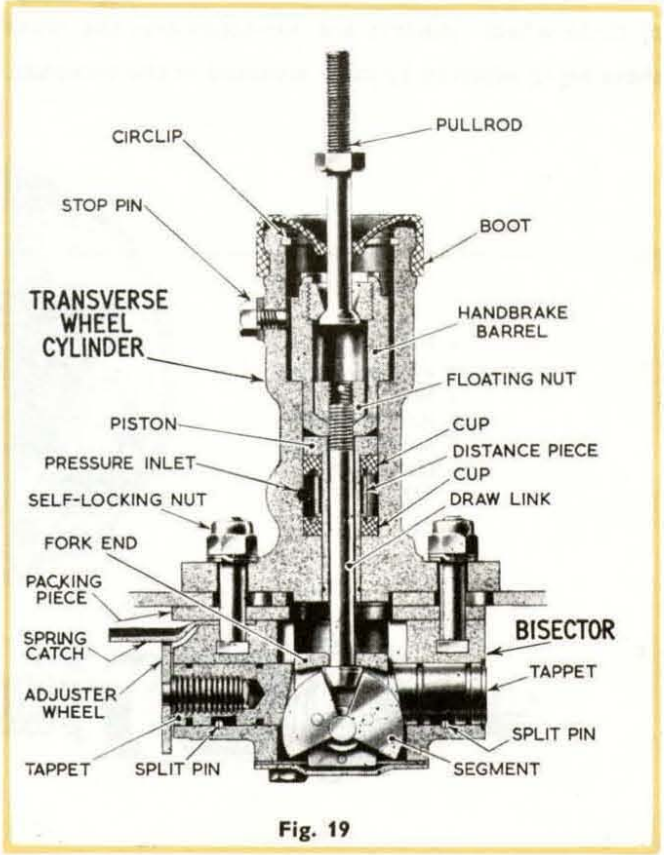


Fig. 19

fork-end assembly, push out the pivot pin (ref. 5, Fig. 21) and separate the various items. Remove the split pins and extract the tappets.

(5) When assembling the bisector, first smear all internal parts with Lockheed Expander Lubricant. Insert the tappets into the body, paying particular attention to the illustrations to ensure correct assembly, and retain them by fitting new split pins ; screw the adjuster wheel (16) into hollow tappet. Pass fork-end over draw link. Place a sector retainer (ref. 3, Fig. 21) on the side of each segment, so that cranked tongue engages the locating hole. Position the segments within the slot of the fork-end so that their inner radii and the retainers are in alignment with the pivot-pin hole, and insert the pin (ref. 5,

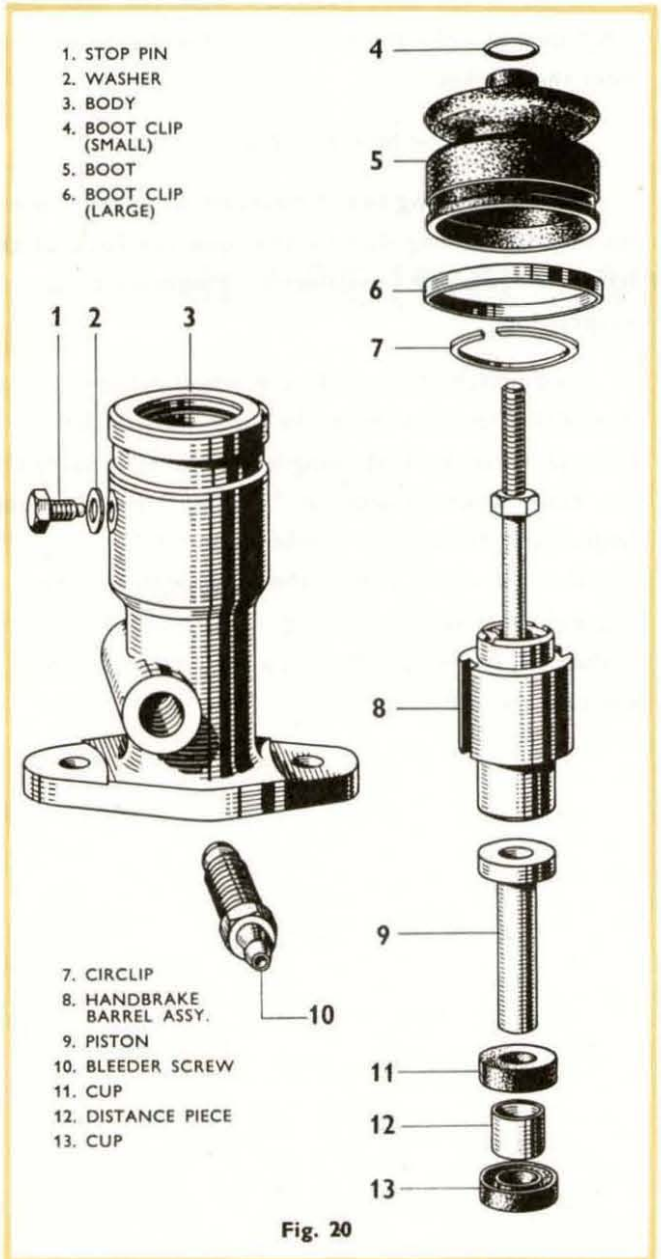


Fig. 20

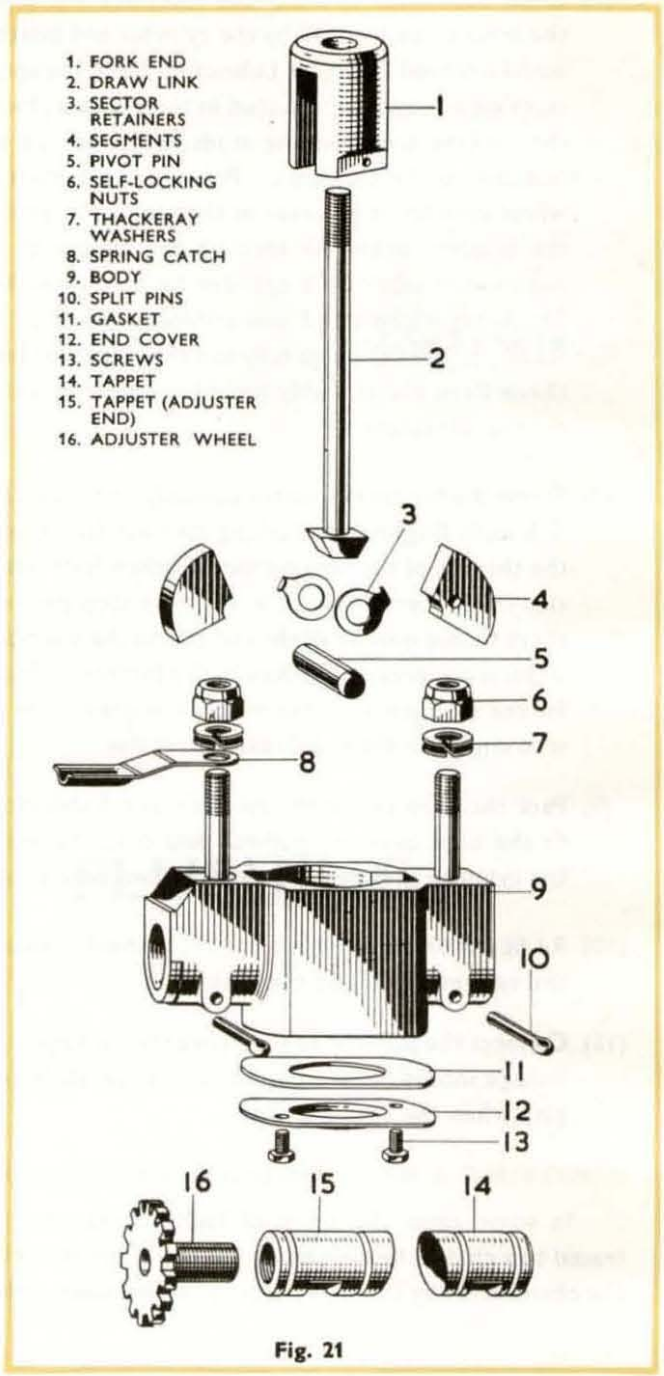


Fig. 21

Fig. 21). Insert this assembly into the body, from the end-cover end, and fit the end cover and gasket (11, 12).

(6) When assembling the transverse wheel cylinder, first fit the two rubber cups on the piston, with the distance piece between them and with the lips of the cups facing each other. Insert these parts into the bore of the body, pressing them in as far as they will go. Smear the handbrake barrel with Rubberlube and insert into the body ; fit the circlip but do not fit the stop pin or boot at this stage.

(7) Clean both sides of the brake backplate and smear the areas to be covered by the cylinder and bisector with Lockheed Expander Lubricant. Place the spring catch on the appropriate stud in the bisector, locate the packing piece on the studs, and offer up the bisector to the backplate. Position the transverse wheel cylinder at the rear of the backplate, guiding the bisector draw-link through the centre of the piston, and secure the cylinder by fitting the two Thackeray washers and new self-locking nuts to the studs ; tighten the nuts fully and then **slacken back three flats,** the assembly should now be free to slide on the backplate.

(8) Screw the handbrake barrel assembly on to the draw link until **finger tight**, taking care not to " cross " the threads of the floating nut. Slacken back until a slot in the barrel is in line with the stop-pin hole, there should now be **slight** end play in the assembly : if this is not present, slacken back a further half turn. Fit the stop pin together with its washer ; the pin is to engage in the handbrake-barrel slot.

(9) Pack the open end of the cylinder with Rubberlube, fit the boot over the pull-rod and onto the end of the cylinder and secure it with the two boot clips.

(10) Re-fit the brake drum and the road wheel, " bleed " the system and adjust the brakes.

(11) Connect the pull-rod to the handbrake linkage ; the linkage should be so adjusted as to allow **slight** end play when the brakes are off.

REMOVING & RE-FITTING A FLEXIBLE HOSE

In some cases the cause of faulty brakes may be traced to a choked flexible hose. Do not attempt to clear the obstruction by any means except air pressure, otherwise the hose may be damaged. If the obstruction cannot be cleared the hose must be replaced by a new one.

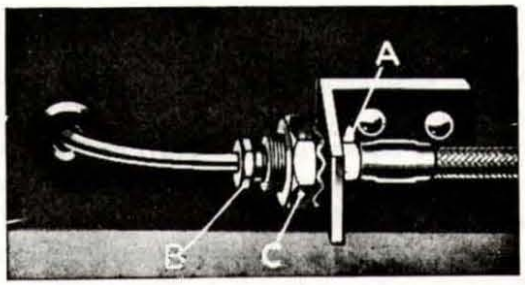


Fig. 22

To remove the flexible hose, adopt the following procedure (referring to Fig. 22, which shows a typical junction) :—

Unscrew the tube nut " B " from the hose union " A," then unscrew the nut " C " and withdraw the hose from the bracket.

Disconnect the hose at the other end.

When refitting brake hoses ensure that there is no risk of fouling due to the steering lock of the front wheels or oscillating movement of the suspension.

First attach the hose to the wheel cylinder (in the case of the front brakes) or the three-way connection (in the case of rear brakes), using a new gasket. Ensure that the hose is not twisted or " kinked " (this is **most important**) then pass the hose union " A " through the bracket and, whilst holding the union with a spanner to prevent the hose from turning, fit the nut " C " and the shakeproof washer ; connect up the pipe by screwing in the tube nut " B."

SECTION 5

BLEEDING AND FLUSHING

SECTION 5 BLEEDING AND FLUSHING

FLUSHING THE SYSTEM

Should the fluid in the system become thick or " gummy " after many years in service, or after a vehicle has been laid up for some considerable time, the system should be drained, flushed and refilled. It is recommended that this should be carried out once every three years. The system should also be flushed if it has become contaminated by the use of spurious fluid.

Pump all fluid out of the hydraulic system through the bleeder screw of each wheel cylinder in turn. Connect one end of a rubber tube to the bleeder screw, allowing the other end to fall into a container, unscrew one complete turn and pump the brake pedal by depressing it quickly and allowing it to return without assistance. Repeat, with a pause in between each operation, until no more fluid is expelled. Discard the fluid extracted. Fill the supply tank with industrial methylated spirit and flush the system by pumping as described above. Keep the supply tank replenished until at least a quart of spirit has been passed through each wheel cylinder.

Where possible, remove the supply tank and pour off the remaining spirit.

Refill with clean Lockheed Super 105 Brake Fluid to Spec. S.A.E. J1703 and " bleed " the system.

Note—If the system has become contaminated by the use of mineral oil, etc., the above process may not prove effective. It is recommended that the various units, including the pipe line, should be dismantled and thoroughly cleaned and that all rubber parts, including flexible hoses, should be renewed. The contaminated fluid should be destroyed immediately.

BLEEDING THE SYSTEM

" Bleeding " the system—or expelling air—is not a routine operation and should be necessary only when some portion of the hydraulic equipment has been disconnected or when fluid has been drained off.

(1) Fill the supply tank with Lockheed Super 105 Brake Fluid to Spec. S.A.E. J1703, and keep at least a quarter full throughout the operation. Otherwise, air will be drawn in, necessitating a fresh start.

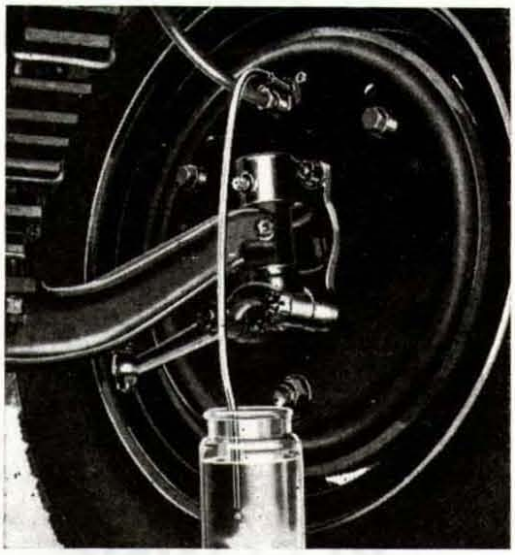


Fig. 23

(2) If the master cylinder used in the system is of a type fitted with a bleeder screw, commence at this unit. Slacken the bleeder screw, depress the brake pedal slowly by hand and, whilst FLUID issues and before the pedal reaches the end of its stroke, tighten the bleeder screw securely.

(3) Attach a rubber tube to a bleeder screw on one of the wheel cylinders and allow the free end to be submerged in a little fluid in a clean glass jar (as on Fig. 23) Open the bleeder screw one complete turn.

(4) Depress the brake pedal slowly, allowing it to return unassisted, repeating this pumping action with a slight pause between each operation. Watch the flow of fluid in the jar and when all air bubbles cease to appear, hold the pedal down firmly and securely tighten the bleeder screw.

(5) Repeat at all wheel cylinders.

(6) Where a tandem master cylinder is fitted, one front and one rear wheel cylinder should be bled simultaneously to obtain the best purge.

Note—Fluid bled from the system should be discarded.

SECTION 6

FAULT FINDING

SECTION 6 FAULT FINDING

1. PEDAL TRAVEL EXCESSIVE

(Requires Pumping).

(*a*) Brake Shoes require adjusting or re-lining if adjustment is already at a maximum.

(*b*) Master Cylinder push rod requires adjusting. (Excessive push-rod clearance).

(*c*) Master Cylinder requires replenishing.

(*d*) Leakage past main cup in Master Cylinder.

2. PEDAL FEELS SPRINGY

(*a*) Linings not " bedded-in."

(*b*) Brake drums weak or cracked.

(*c*) Master Cylinder fixing loose.

3. PEDAL FEELS SPONGY

(*a*) Leakage past main cup in Master Cylinder.

(*b*) Master Cylinder secondary cup worn. (Air bubbles rise in supply tank).

(*c*) Leak at one or more points in system.

(*d*) Brakes not properly bled.

4. BRAKES INEFFICIENT

(*a*) Linings not " bedded-in."

(*b*) Linings greasy.

(*c*) Linings incorrect type.

5. BRAKES DRAG

(*a*) Shoes over adjusted.

(*b*) Shoe pull-off springs weak or broken.

(*c*) Pedal spring weak or broken.

(*d*) Pedal to push rod adjustment incorrect.

(*e*) Handbrake mechanism seized.

(*f*) Wheel Cylinder piston seized.

(*g*) Supply tank overfilled or filler cap vent hole blocked.

(*h*) Master Cylinder by-pass port choked.

(*i*) Handbrake cables over adjusted.

6. BRAKES REMAIN ON

(*a*) Shoes over adjusted.

(*b*) Handbrake over adjusted.

(*c*) Pedal to push rod adjustment incorrect.

(*d*) Master Cylinder and/or wheel cylinder cups swollen, due to contamination with mineral oil or spurious fluid.

7. UNBALANCED BRAKING

(*a*) Greasy linings.

(*b*) Distorted drums.

(*c*) Front spring broken or loose at anchorage.

(*d*) Tyres unevenly inflated.

(*e*) Brake backplate loose on axle.

(*f*) Worn steering connections.

(*g*) Worn spring shackles.

(*h*) Different grades of linings fitted.



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